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NMR&D News is an authorized publication of the Naval Medical Research Center, 503 Robert Grant Avenue, Silver Spring, MD 20910. **NMR&D News** is published monthly by the NMRC Public Affairs Office, 301-319-9378, 301-319-9425 or [click here](#) to email us.

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Navy Medicine Leadership Attend US/UK Information Exchange Meeting

Story courtesy of NSMRL Public Affairs



Virginia-class submarine USS North Carolina (SSN-777) pulls into Republic of Korea (ROK) Fleet base. (U.S. Navy Photo by Mass Communication Specialist 3rd Class Jermaine M. Ralliford/Released)

GROTON, Conn. - U.S. Navy Medicine researchers, along with members from the U.K. naval medical research communities, met in Gosport, U.K. to exchange research findings and discuss common issues on submarine research hosted, at the Institute of Naval Medicine (INM) headquarters.

INM Medical Officer-in-Charge, Capt. Michael Howell, attended the exchange meeting along with other Navy Medicine leadership. Attendees included the Head of Undersea Medicine for the Bureau of Medicine and Surgery (BUMED), Capt. Edward Waters; and, Commanding Officer, Naval Medical Research Center (NMRC), Capt. Jacqueline Rychnovsky, who led the U.S. delegation. Other attendees included the Commanding Officer of Naval Submarine Medical Research Laboratory (NSMRL), Capt. Fred

Yeo and several members of the NSMRL staff; Force Medical Officer for the U.S. Submarine Force's Atlantic Fleet, Capt. Matthew Hickey; and, Officer-In-Charge of the Naval Undersea Medical Institute, Cmdr. James Mucciarone.

During the meeting attendees were updated on the status of various organizations represented in order to prepare for more specific discussions to follow.

Additionally, Deputy Head of Undersea Medicine BUMED, Capt. Jeffery McClellan, Rychnovsky and Hickey discussed their respective concerns while Surgeon Commander Ravi Ramaswami provided an update for the U.K.

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NMRC Commanding Officer's Message



Remaining at the cutting-edge of medical R&D cannot be done in a vacuum; it requires significant collaboration, as you will see from stories in NMR&D News. Seeking and working with the best scientists provides incredible value to our research efforts and ensures that we are being financially efficient delivering products that have maximum effectiveness for warfighters. Our mission demonstrates the greatest value when we advance products that help Sailors, Marines, and warfighters throughout the DoD, and contributes to improving global health. Throughout Navy R&Ds global enterprise, research teams are collaborating with other services, a myriad of biomedical professionals from U.S. industrial and academic communities, and international allies and partners. There are numerous examples of efforts throughout our enterprise with DoD partners, the U.S. Government Interagency, academia and host nation partners of our overseas laboratories. Some of these examples are NAMRU-Dayton's participation in the Tri-Service Toxicology Consortium, laboratory collaboration with the Air Force identifying and evaluating candidate physiological and gas sensors for in-flight hypoxia detection; scientists at NMRC working with Army colleagues at the Walter Reed Army Institute

of Research (WRAIR) studying long-term effects of blast exposure; malaria research in Southeast Asia with Armed Forces Research Institute of Medical Research and WRAIR; and, academic partners at Wake Forest, Duke University and the Uniformed Services University of Health Sciences.

Our NAMRU-3 laboratory in Cairo works closely with the CDCs Global Disease Detection laboratory. In these activities, our most important partners are host nation colleagues where activities are dependent on strong collaborations. This edition also highlights a special relationship with the Royal Navy submarine medical team and shows jointness as we prepare to share lab space in the new U.S. Army Research Institute of Infectious Diseases (USAMRIID) facility at Fort Detrick, Maryland. In Navy Medicine R&D we showcase the power, purpose and importance of collaboration. Author Vishwas Chavan says "if we don't collaborate we will be limited to our own abilities and will never achieve the impact we are anticipating." I agree! NMRC salutes their collaborative partners and looks forward to strengthening relationships meeting our goal to improve care for the warfighter.

NMRC Commanding Officer sends,
Jacqueline D. Rychnovsky, CAPT, NC, USN

NAMRU-6 Commanding Officer's Message

Greetings from Lima and the only Department of Defense Command in South America as we come to the end of summer and are about to enter fall. I am amazed that it has only been 6 months and it has been a great first 6 months. Our entomology department has continued with its advancement and development of the *Anopheles Darlingi* colony, a unique resource for malaria research and vaccine development. They have partnered with the parasitology department and increased sporozoite production in the colony which will allow characterization of *plasmodium vivax* and hopefully the eventual development of vaccine candidates against malaria. Virology emerging infections department has been working on ribosomal profiling leading to deeper understanding of disease pathogenesis and the complexities of host responses to infection. Our bacteriology department advanced phage discovery of candidates against multidrug resistant bacteria and has now started to receive samples from remote areas of Amazon River tributaries from our collaboration with the Peruvian Navy and their system of social inclusion riverine vessels.



We also look forward to the next 6 months which will be full of change. We have new Surgeons' Generals in both the Peruvian and U.S. Navies, presidential elections in the U.S. and in Peru. We have a new Peruvian Liaison Officer that has already led to new initiatives and avenues of research in the Peruvian Naval Hospital. Construction on the new conference building will commence and the completion of our state of the art insectary in our research site in the jungle in Iquitos will be completed in July as we simultaneously move forward with our lab renovation plans in Lima. We are also engaging the Embassy with GHSA and helping them to engage Peru in the initiative. We are looking at the restructuring of GEIS, possible new funding models for the enterprise under NMW and implement Dr. Walz's challenge of doing better with less. We look forward to being a premier tri-service overseas biomedical research organization, constantly relevant, integrating basic research and advanced technology that protects, projects, and sustains uniformed service members today, invents global medical solutions for the future, and keeps service members and Allies on point for the Nation.

NAMRU-6 Commanding Officer sends,
Adam Armstrong, CAPT, MC, USN

Navy Submarine Medicine Researchers Join UK Partners to Talk Shop

Story by Doris Ryan, Naval Medical Research Center Public Affairs



(Front row L-R) Capt. Edward Waters (Director, Undersea Medicine and Radiation Health – BUMED), Capt. Jeffrey McClellen (Deputy Director, Undersea Medicine and Radiation Health – BUMED), Capt. Jacqueline Rychnovsky (Commanding Officer - NMRC), Capt. David Regis (USN-UK Exchange Undersea Medical Officer – Royal Navy Institute of Naval Medicine); (Back row L-R) Capt. Fred Yeo (Commanding Officer - NSMRL), Capt. Matthew Hickey (Force Medical Officer - COMSUBLANT), Cmdr. Hugh Dainer (Head, Undersea Medicine Department - NMRC)

SILVER SPRING, Md. – A delegation from the Navy Medicine R&D enterprise made up of submarine medicine researchers and leadership attended the US-UK Submarine Exchange meeting in Gosport, U.K., Feb.

22. The purpose of the meeting was to exchange ideas and information as well as develop collaborations on common medical issues encountered by the U.S. and Royal Navy submarine communities. The

meeting, hosted by the Royal Navy Institute of Navy Medicine, was re-established after a five year hiatus.

Representatives from the U.S. Navy Bureau of Medicine and Surgery, Naval Medical Research Center (NMRC), Naval Submarine Medical Research Laboratory, and Naval Undersea Medicine Institute joined their counterparts from the Royal Navy and UK academia in presenting their work. The presentations covered such topics as fitness standards, mental health, human factors, environmental hazards and monitoring, as well as medical approaches to disabled submarine escape and rescue.

“I was struck by the similarities we share with the Royal Navy Medical Department concerning care of submariners,” said Capt. Jacqueline D. Rychnovsky, commanding officer, Naval Medical Research Center. “Each presentation highlighted the strength in numbers for collaborative research and encouraged productive conversations and problem solving. The Royal Navy is our true Sister Service and we all returned with many ideas for new collaborations.”

A major focus of the meeting was the unique health issues brought about with the

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Navy Medicine Leadership Attend US/UK Information Exchange Meeting

(continued from page 1)

The meeting identified many common areas of concern in submarine medical operations. One major topic was submarine escape and rescue. Particular aspects included updates on the respective rescue systems, North Atlantic Treaty Organization and the U.S., and medical operations during rescue including triage to decompression of survivors and oxygen generation while awaiting rescue.

Another major topic was submarine atmosphere control including the impact of the CO₂ levels for mixed-manning and

the issue of allowing e-cigarettes on board a submarine. Additionally, the unique stresses of submarine duty brought about discussion related to behavioral topics including executive coaching of senior leadership, mixed-manning, psychological screenings and team performance.

On the final day of the meeting there were presentations of ongoing research on the nutrition and energy expenditure of submariners from INM staff members, Lt. Cmdr. Lindsay and Dr. Fran Gunner. Lindsay and Gunner’s work was comparable to work undertaken at NSMRL and with similar conclusions

regarding Vitamin D supplementation, body mass changes during patrols and metabolic markers.

Academics from the University of Oxford, the University of Birmingham, the University of Plymouth and the University of Surrey also attended the exchange meeting and discussed some of their proposed research including liver health and microbiome. After the exchange meeting Surgeon Cmdr. Richard Webber, a former exchange officer, was congratulated by the attendees on organizing the program, which has not been held since 2011.

Navy SG Tours Vibrant R&D at NAMRU-San Antonio

Story courtesy of NAMRU-SA Public Affairs



Vice Adm. C. Forrest Faison, surgeon general and chief, Bureau of Medicine and Surgery (left) met with Cmdr. Forest Sheppard, U.S. Navy trauma surgeon, and Head of NAMRU-SA's Expeditionary and Trauma Medicine Department (front, right) and his team of Navy scientists to learn more about NAMRU-SA's life-saving research in shock, resuscitation, and testing and evaluation of hemorrhage control devices. (Courtesy of NAMRU-SA Public Affairs)

SAN ANTONIO – Navy Surgeon General and Chief, Bureau of Medicine and Surgery (BUMED), Vice Adm. C. Forrest Faison spent a half day meeting with Navy researchers at the Naval Medical Research Unit – San Antonio (NAMRU-SA) during a tour of the facilities, Feb. 19, part of his two-day visit with Navy Medicine commands in San Antonio.

In attendance with Faison was Force Master Chief (FMF/SW/AW) Terry Price and director of the Hospital Corps.

Faison received an overview of current projects from NAMRU-SA's Commanding Officer, Capt. Elizabeth Montcalm-Smith and senior leaders in meeting with various teams of Navy researchers.

"As a ready medical force, making sure we can save lives and keeping our specializations strong is critical to Navy Medicine's success, and you are central to both those efforts," said Faison.

Faison also toured the world-class Tri-Services Research Laboratory to learn

more about research in the evaluation of interventions to stem and control hemorrhage and provide resuscitation.

Cmdr. Forest Sheppard, Navy trauma surgeon, and Head of NAMRU-SA's Expeditionary and Trauma Medicine Department explained how investigations are underway to develop and test in-laboratory assays to help understand the molecular aspects of the immune response to shock and long-term effects of shock in warfighters.

Scientists on Sheppard's team discussed their exploration of the capacity of a service member's immune system to respond to injury (immuno-typing) before an injury happens and how this has the potential to be a profoundly invaluable tool for clinical decision-making.

"Your work extends the capabilities to keep a combat casualty alive and enables us to send them back home to mom and dad," said Faison. "There are service members out there, alive today because of the things you do right here in this lab. What you do

makes a difference in survival rates and keeping people healthy."

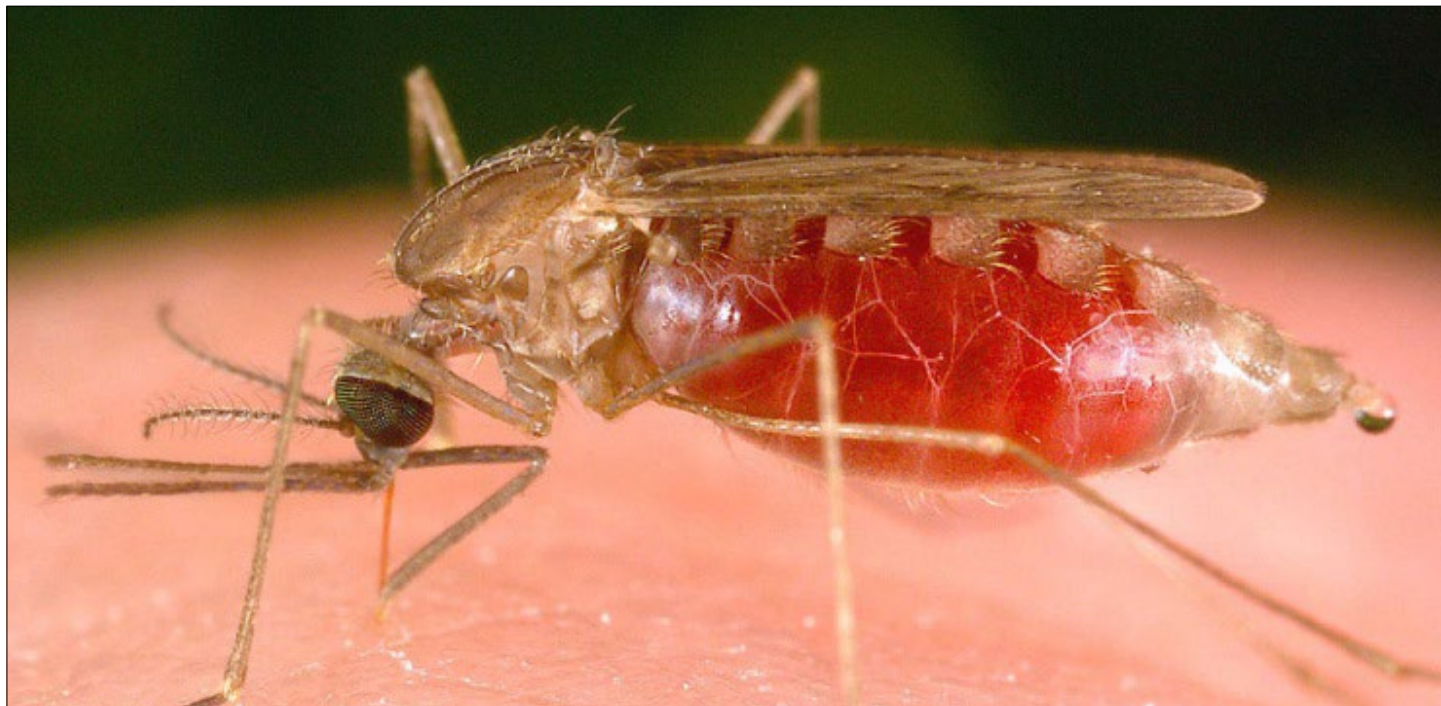
Maj. Craig Koeller, Army veterinarian, attached to NAMRU-SA and Mr. Henry Buckley, head of NAMRU-SA's administration department, were two of the three staff recognized for significant contributions to NAMRU-SA's success by Faison and each received one of his personal coins during the all-hands call.

Faison also talked about the future of the Navy and his vision for the future of Navy Medicine.

"Cutting-edge R&D [research and development] and innovative medical education are hallmarks of military medicine and directly enable our readiness mission," said Faison. "Readiness is not just for today, but also readiness for tomorrow. Over the years, some of medicine's most important breakthroughs have come from Navy R&D programs and I am in awe of what I have seen here today."

NAMRU-D Scientists Working to Define Mosquito Exposure-Response to Insecticides

Story by Lt. Cmdr. Carlis Brown, NAMRU-Dayton



Mosquito-borne diseases, such as Dengue virus and malaria, are a constant threat to people residing in sub-tropical and tropical regions around the world and to military personnel deployed to those areas. (Photo courtesy of the Centers for Disease Control and Prevention)

DAYTON, Ohio - Mosquito-borne diseases, such as Dengue virus and malaria, are a constant threat to people residing in sub-tropical and tropical regions around the world and to military personnel deployed to those areas. These two diseases impact more than three billion people annually. The control of such diseases poses a large challenge for global health efforts.

An environmental and health effects research team from the Naval Medical Research Unit- Dayton (NAMRU-D) plan to study the exposure-response relationship between an insecticide with low persistency (e.g., transfluthrin) and *Aedes* and *Anopheles* mosquitos. Developing exposure-response curves will be critical to understanding the relationship between the concentration of an airborne spatial repellent (SR) product and the resulting change in mosquito behavior.

The NAMRU-D team will leverage their years of experience in designing and operating exposure systems for toxicology studies to develop unique mosquito exposure chambers capable of generating discrete, known airborne concentrations of spatial repellent (SR) compounds. This project could establish a standard product evaluation process and provide valuable information on the

performance of SR compounds across mosquito species.

Personal SRs or area SRs may be highly effective vector control tools and more acceptable to military personnel since there is little need for end-user action, which makes it easier to provide force health protection for operations in mosquito-borne disease endemic regions.

Currently, the evaluation of approved SR products for utility and efficacy for military personnel does not include the detection and quantification of SR chemicals correlating to mosquito behavior. The development of objective, repeatable test systems and procedures is critical to properly evaluate product performance.

Defining the relationship for a variety of mosquitos known to transmit the malaria parasite (*Plasmodium*) and viruses that are transmitted by arthropod vectors (arboviruses), such as mosquitos, would greatly enhance the ability of DoD decision makers to evaluate SR products. The evaluation could determine if any of the SR products are appropriate for further development and deployment for the protection of military personnel.

NHRC CO Addresses Medical Research Collaboration at Defense Health Board Meeting

Story courtesy of Naval Health Research Center Public Affairs

SAN DIEGO - The Naval Health Research Center (NHRC) Commanding Officer, Capt. Rita Simmons, addressed current challenges and future opportunities for military medical research processes during a presentation to the Defense Health Board (DHB), Feb. 10.

The DHB held its quarterly meeting in San Diego to review current processes for initiation, funding, oversight and conduct of Defense Health Program medical research in the Department of Defense (DoD), and to explore opportunities for improvement.

During Simmons' presentation, she leveraged her extensive experience as a Navy Medicine researcher to highlight specific opportunities for improving processes. These included: creating an easily accessible virtual tool to increase visibility of funding and research opportunities to all military medical research labs; encouraging intramural collaboration throughout the DoD; facilitating opportunities for clinicians and researchers to collaborate; and, encouraging professional development by establishing a research career-track

for military officers and facilitating mentoring for junior researchers.

"I was honored to have the opportunity to provide my perspective about medical research processes to the distinguished board," said Simmons. "As someone who has been conducting medical research for 20 years, I understand the importance of examining our current methods and investigating whether or not there are novel and more cost-effective ways of accomplishing our research mission. Innovation and science go hand-in-hand."

According to Simmons, with the Defense Health Agency (DHA) having achieved full operating capability, integrating the medical research practices and processes of the different military services into a cohesive, DoD-wide program is an important next step requiring an in-depth understanding of the current state of the science for each service.

"As the DHA evolves, aligning how the Navy, Army, and Air Force initiates and conducts research across the

military medicine enterprise is vital," said Simmons. "Whether we are optimizing warfighter performance, improving patient care, or developing and testing products to improve health and readiness, being in sync will streamline processes and elevate best practices. Together, we can achieve high levels of innovation, collaboration, and excellence."

The DHB is a Federal advisory committee that provides independent advice and recommendations on matters pertaining to health care policy, program management and operations within the Department of Defense (DoD), including health research, to the secretary of defense.

As the DoD's premier deployment health research center, NHRC's cutting-edge research and development is used to optimize the operational health and readiness of the nation's armed forces. In proximity to more than 95,000 active-duty service members, world-class universities, and industry partners, NHRC sets the standard in joint ventures, innovation, and translational research.

Navy Submarine Medicine Researchers Join UK Partners to Talk Shop

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introduction by both navies of women on submarines.

The meeting was well received by all participants and confirmed the commonality of medical challenges facing both submarine forces and potential benefits in terms of knowledge sharing that could be had with future collaborations and exchanges. In response to this, plans for establishing future meetings at more frequent and regular intervals are underway.

"This meeting is a natural extension of the ongoing Undersea Medical Officer exchange program by allowing a host of subject matter experts from each country to meet and discuss common issues in their respective fields," said Capt. David Regis, USN Exchange Officer. "It is already expected that this meeting will impact certain medical program implementations and guide future research efforts."

Regis began his tour as the USN Exchange Officer in July 2015. Though dual hatted as both a submarine and diving medical

officer, he is primarily serving as the USN subject matter expert to the Royal Navy on diving medicine, training medical personnel, medically supporting diving and submarine rescue operations/assets as well as assisting with diving medicine policy and research review.

The US/UK Undersea Medicine exchange program, which has been in place since 1967, brings mutual benefits to the U.S. and Royal Navies through collaboration and efficient sharing of information and resources.

NAMRU-D Participates in the Tri-Service Toxicology Consortium

Story courtesy of NAMRU-Dayton Public Affairs



DAYTON, Ohio - Senior scientific staff members of Naval Medical Research Unit Dayton's (NAMRU-D) Toxicology Directorate virtually participated in another successful round of the Tri-Service Toxicology Consortium (TSTC) meeting. This year the meeting was hosted at the U.S. Army Public Health Command at Aberdeen Proving Ground, Maryland, Feb. 17-18.

Opening remarks were given by the Director of the Army Public Health Center, Mr. John Resta; after, members of the TSTC made updates on scientific projects and programs either onsite or by means of digital communications systems.

Four NAMRU-D senior scientific staff members presented detailed scientific updates. The first was from by Dr. Brian Wong, NAMRU-D co-presenter with Dr. Dave Mattie,

711th Human Performance Wing / Molecular Bioeffects branch (711 HPW/RHDJ). Wong and Mattie updated the attendees on their development in evaluating the acute inhalation toxicity of *polyalphaolefin* fluid.

NAMRU-D's Inhalation Toxicology Department Head, Lt. Cmdr. Carlis Brown, provided an update to a proposed joint project with NMRC-Asia in relation to insecticide exposures. Brown also presented on behalf of Dr. Kimberly Mallory of NAMRU-SA on a joint project on the cytotoxicity of nano dental materials.

NAMRU-D Senior PBPK Toxicologist, Dr. Lisa Sweeney provided an update on a joint project with the U.S. Army Edgewood Chemical Biological Center (ECBC) on carbon monoxide acute toxicity when concentration varies with time.

Underlining another collaborative project with the USAF 711th HPW/RHDJ, Dr. Karen Mumy, Environmental Health Effects Research Deputy Director, provided an update on jet fuel neurotoxicity.

Additional updates were provided by the 711 HPW/RHDJ, U.S. Army Public Health Command, and U.S. Army Center for Environmental Health Research, Navy Marine Corps Public Health Center, U.S. Army Engineering Research and Development Center, Naval Surface Warfare Center Dahlgren Division and Naval Medical Research Unit-San Antonio.

The TSTC meets twice a year to present research updates and proposal opportunities to assure minimal duplication of efforts and to identify areas for collaborative projects to maximize joint efforts across the DoD toxicology research programs.

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Graphic illustration by Mikelle D. Smith, Naval Medical Research Center Public Affairs

Toward a Better Understanding of Brain Injury

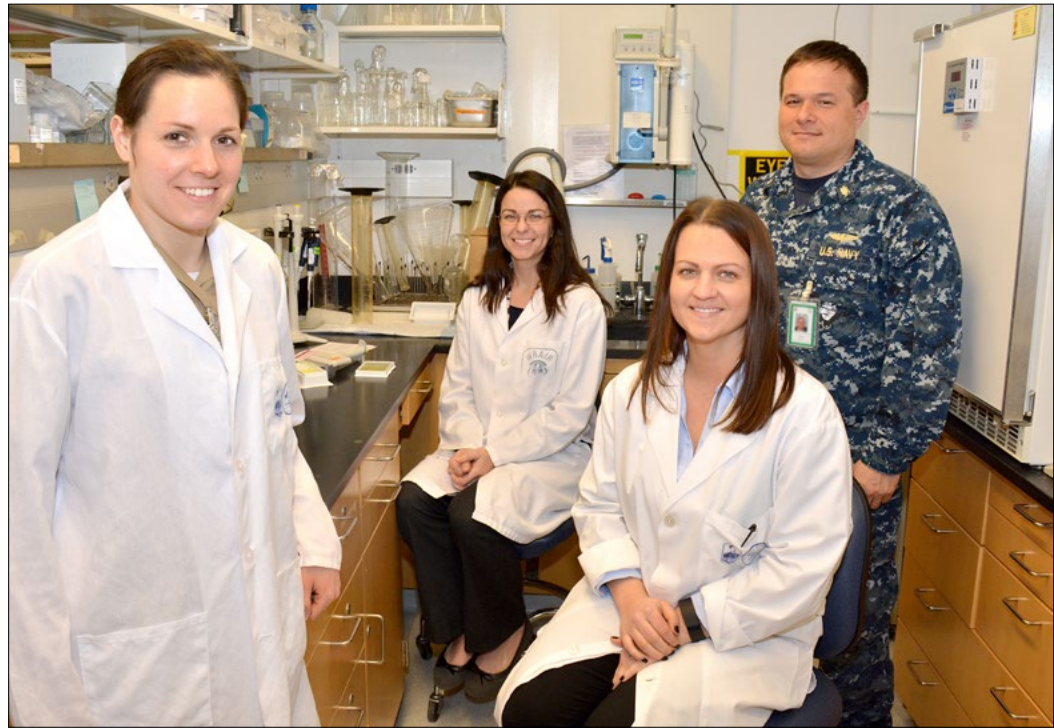
Blog by Lt. Cmdr. Peter B. Walker, Naval Medical Research Center

SILVER SPRING, Md. - For the Neurotrauma Department (NTD) at the Naval Medical Research Center (NMRC) in Silver Spring, Maryland, the month of March signals the kickoff of Brain Injury Awareness Month. To do our part NTD (comprised of more than 20 military, government civilian, and government contractors) has been an active participant at several local and national events that help to highlight our role as one of the leading laboratories in the country focused on neurotrauma research.

Recently, Lt. Jacob Norris (Research Psychologist) was invited to Northeastern University by Nu Rho Psi, the National Honor Society for Neuroscience, to give a guest lecture on NTDs ongoing research program in Traumatic Brain Injury (TBI) and Post-traumatic Stress Disorder (PTSD). Later this month, Lt. Norris will be giving a similar lecture to his alma-mater at Texas Christian University. These invited talks help illustrate the notoriety that NTD has received within this research domain to push the boundaries of our knowledge on this important topic.

To assist in local STEM outreach, Lt. Melissa Mehalick, an NMRC research psychologist, and I (an aerospace experimental psychologist) will be participating in a local workshop demonstration at the National Military Medical Museum in Silver Spring, Maryland. Here, our department will discuss one aspect of our research program, Occupational Standards to Repeated Low-Level Blast Exposure. The focus of this research program is to develop a better understanding of the long-term health impacts for warfighters exposed to blast. We will be demonstrating to these students the physics of blast and provide the students an opportunity to interact with several different types of protective gear including helmets, Kevlar vests, and blast dosimeters.

In order to understand the pathophysiology behind different forms of neurotrauma including TBI and PTSD, our department developed a laboratory model



(From left) Researchers in Naval Medical Research Center's (NMRC) Neurotrauma Department, Lt. Melissa Mehalick, Dr. Amanda Glueck, Dr. Anna Tschiffely and Lt. Cmdr. Peter Walker. (Photo courtesy of Naval Medical Research Center Public Affairs)

that investigates the acute and chronic effects of blast exposure. Our researchers have investigated the interactions between blast exposure and fear circuitry in the brain. For example, Dr. Anna Tschiffely and Dr. Amanda Glueck have begun to assess fear circuitry damage and molecular correlates of TBI and PTSD following blast. They have measured Stathmin-1 protein and corticosterone levels. Early evidence is suggestive that Stathmin-1 protein levels may be elevated in the amygdala after acute exposure to blast.

Our research is not just limited to understanding the acute effects of TBI. Our group has recently launched a multi-year effort to understand the long-term health outcomes of blast-induced concussion. Our group has developed a surveillance database of over 2500 military service members who developed a blast-induced concussion in theater. For this effort, NTD partnered with the Armed Forces Health Surveillance Center to examine neuroendocrine

dysfunction and the likelihood of poor cardiovascular health for post-deployment warfighters. We've argued that such an understanding will enhance screening and surveillance for persistent post-concussive syndrome and mental health disorders like Post-traumatic Stress. Additionally, understanding the strength of the relationship between neuroendocrine and cardiovascular problems with persistent post-concussive syndrome or post-traumatic stress disorder will improve Navy Medicine's ability to plan for patient care in the coming years.

Research initiated because of military engagements throughout the Middle East, remain important as we shift toward understanding long-term health implications for wounded warriors. Our department will continue to be engaged and focus on the development of novel and innovative empirical methodologies to address brain injury.

NAMRU-SA's 2015 Gold Star of Excellence in Scientific Writing Award Winners

Story courtesy of NAMRU-SA Public Affairs



The authors of the technical report, "Evaluation of the Effectiveness of a Portable Ozone Sterilizer System" were selected as the 2015 winners of NAMRU-SA's Gold Star of Excellence in Scientific Writing Award. NAMRU-SA Commanding Officer, Capt. Elizabeth Montcalm-Smith (2nd from right) presented the award to Luis A. Martinez, Ph.D., lead author and ORISE Postdoctoral Fellow (second from left), Heather M. Grossman, MS., research associate (left), and Roy E. Dory, MS, biomedical engineer and Principal Investigator for the project (right). (Courtesy of NAMRU-SA Public Affairs)

SAN ANTONIO - Every year the Naval Medical Research Unit-San Antonio (NAMRU-SA) recognizes distinguished achievements in articles and technical reports with the *Gold Star of Excellence in Scientific Writing Award*, which is presented each February.

The award is conferred upon an individual or team of authors whose written product is deemed significant, exceptionally well-researched and skillfully written. The authors of the technical report, *Evaluation of the Effectiveness of a Portable Ozone Sterilizer System* were selected as the 2015 winners.

A NAMRU-SA ORISE postdoctoral fellow, Dr. Luis A. Martinez, was recognized for his outstanding professional achievement as lead author along with his rigorous data

analysis, and excellent documentation of the testing and evaluation of the efficiency of ozone to eliminate bacteria of military interest.

Ms. Heather M. Grossman, research associate for the project was acknowledged for her exceptional technical contributions, testing and evaluation, data analysis, and for writing all the Standard Operating Procedures for the sterilization system.

Mr. Roy E. Dory, NAMRU-SA biomedical engineer and Principal Investigator for the project was recognized for his exemplary editing skills that significantly contributed to a document of innovative thinking and impeccable science communications.

"This technical report, was written with clarity, meticulous attention to detail, and presented a compelling

model to facilitate the development and meaningful evaluation of an innovative new product from lab prototype to a truly portable and self-sufficient field sterilizer that can be deployed with medics and corpsmen to enhance the healthcare available to the warfighter," said NAMRU-SA Commanding Officer, Capt. Elizabeth Montcalm-Smith.

All manuscripts and technical reports produced at NAMRU-SA within the calendar year are reviewed and the best three papers are nominated to be considered for this special award. A panel of three judges examines each paper and enters a set of numeric scores. The paper with the highest total score from the judges is selected as the winner.

R&D Chronicles

Part III Behnke, Momsen, and the Advent of Submarine Rescue

By André B. Sobocinski, Historian, Bureau of Medicine and Surgery

(Continued from February 2016 Issue)

"In contrast with previous diving methods, the distinguishing features of the diving technic were successful employment of helium-oxygen mixtures for deep diving in cold water, made necessary by the failure of the standard method using air, and the effective use of oxygen permitting the decompression of divers without injury."

~Lt. Albert Behnke, MC, USN, 1940

From May 24 through August 1, 1939, some 372 dives were conducted to rescue and later help salvage the Squalus (SS-192). Although several accidents occurred during the operations, it was remarkable that not a single case of bends was diagnosed.

The mission was notable in the first use of Heliox (Helium-Oxygen) mixture in a rescue operation. Over the previous 20 months prior to the sinking of the Squalus, Lt. Albert Behnke lead Naval Expeditionary Dive Unit (NEDU) personnel in conducting laboratory experiments in a pressure tank to determine the value of Helium-Oxygen mixtures in deep-sea diving.

The Helium-Oxygen mixture reduced the risk of narcotic symptoms while breathing under pressure. The Squalus-mission allowed for the helium experiments to be realized in a real-world setting below 150 feet.

The helium supplied for the operation came from the Naval Air Station Lakehurst, New Jersey, a former base for the Navy's dirigible fleet. Oxygen and Helium gases were combined at the Portsmouth Navy Yard, each cylinder contained 75 percent helium and 25 percent oxygen. Composition was assessed at a make-shift laboratory established dock-side.

Cylinders were transported aboard the Falcon (ASR-2) to the site of the operation. A hose connected to the diver's helmet from the Falcon's manifold and recirculated the gas through an aspirator. The Squalus dives also saw the use of several other innovations including electrically-heated garments for



Secretary of the Navy Charles Edison reading Letter of Commendation from President Franklin D. Roosevelt to several members of the USS Squalus (SS-192) salvage unit, in his Navy Department offices, 16 September 1939. The others present are (from left to right): Commander Charles B. Momsen, USN; Chief Metalsmith J.H. McDonald, USN; Chief Torpedoman W.H. Squire, USN; Ship Fitter First Class H.H. Frye, USN; Torpedoman First Class J.W. Thompson, USN; Lieutenant Karl R. Wheland, USN; Commander Henry Hartly, USN, and Commander Allan R. McCann, USN. (Photo courtesy of the Naval History and Heritage Command)

cold-water diving improved recirculation of gas through the diver's helmet, and the use of telephonic communication between submarines

The Legacy of the Squalus Rescue

President Franklin Roosevelt would commend the personnel involved in the Squalus rescue and in 1942 relate the story in a Fire-side chat as a means of imbuing hope to an American public in the midst of a new war.

Several divers involved in the rescue operation would be recognized with four Medals of Honor and 46 Navy Crosses. Among the latter were two Hospital Corpsman-divers based at the NEDU -

PhM1c Francis Lucas Westbrook and PhM1c Benjamin Taylor Morris.

NEDU's former officer-in-charge, Charles "Swede" Momsen would go on to command two submarine squadrons and the battleship USS South Dakota (BB-57) in World War II. After the war, he rose to the rank of Vice Admiral. Momsen died (May 25, 1967) nearly 28 years to the day after the sinking of the Squalus.

Dr. Albert Behnke would continue to work in undersea medical research earning a reputation as one of the Navy's foremost authorities in the field. Later promoted to Captain, Behnke would serve as the Director of the Naval Radiological Defense Laboratory in San Francisco, California, before retiring in 1959.

Behnke would later serve as the namesake of an award given annually by the Undersea and Hyperbaric Medical Society to scientists who have made significant advances in the field of biomedical research.

Most incredibly, USS Squalus would sail again. Although her name was retired and never again used by the Navy, the salvaged Squalus was recommissioned in May 1940 as USS Sailfish (SS-192).

During World II, Sailfish would be awarded nine battle stars and a Presidential Unit Commendation for service. She would later be scrapped in 1948.

IDD Hosts a Seminar with Guest Scientist at NMRC

Story courtesy of Cmdr. Michael Stockelman, Naval Medical Research Center

SILVER SPRING, Md. - The Naval Medical Research Center's (NMRC) Infectious Diseases Directorate (IDD) held a seminar in the Albert R. Behnke Auditorium, Feb. 19.

Guest Scientist Dr. Gary J. Vora, a deputy laboratory head at the Center for Bio/Molecular Science and Engineering under Naval Research Laboratory (NRL), presented his work developing technologies for tracking antibiotic resistance genes.

The first of two projects was a molecular epidemiology tool called Antimicrobial Resistance Determinant Microarray [ARDM], which enabled the simultaneous screening of 236 antibiotic resistance genes conferring resistance to 16 classes of antimicrobial compounds.

In collaboration with Navy Medicine Research and Development Enterprise laboratories, USAMRU-K and the Centers for Disease Control and Prevention (CDC), he determined location-specific resistance gene patterns, using clinical *Escherichia*, *Salmonella*, *Shigella* and *Campylobacter* isolates from Cambodia, Egypt, Kenya, Peru and the United States.

Surveillance of the emergence and spread of antibiotic resistance will be a crucial part of maintaining the effectiveness of these countermeasures to infectious disease. Vora found 64 different antibiotic resistance genes that affected the performance of 13 classes of antibiotics.

Of the regions tested, isolates from Egypt harbored the greatest circulating diversity of aminoglycoside and beta-lactam resistance genes. The survey also documented very widespread presence of class 1 integrons in



Guest Scientist Dr. Gary J. Vora (right), a deputy laboratory head at the Center for Bio/Molecular Science and Engineering under Naval Research Laboratory (NRL), presented his work developing technologies for tracking antibiotic resistance genes. (Photo courtesy of Cmdr. Michael Stockelman)

Kenya, while they were absent from Cambodia. Integrons are a genetic mechanism that results in transfer of genes among species, so these results may help anticipate the relative spread of resistance genes in these areas.

The second project presented by Vora was a comparison of three clinically applicable technologies (antibiotic resistance microarray, massively multiplexed PCR and sequencing, and shotgun metagenomics sequencing) that can be used to rapidly characterize the resistance gene status of the bacteria that are present.

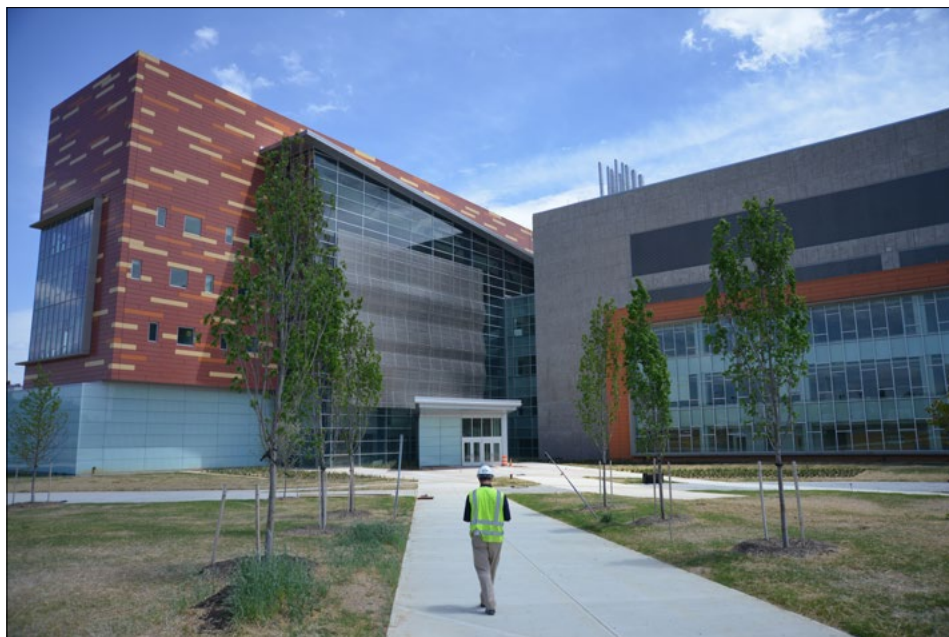
This test, in addition to helping establish the performance of the

new technology, will tell more about the impact of antibiotic treatment on resistance genes in the patient's bacterial flora.

Both of these new technologies can increase situational awareness by establishing baselines for the existing distribution of resistance genes. Knowing this, researchers can spot the emergence of novel genetic patterns of resistance, and influence decision support and regional infection control practices.

NMRC Leadership Tours New USAMRIID Facility at Ft. Detrick

Story by Doris Ryan, Naval Medical Research Center Public Affairs



The new U.S. Army Research Institute of Infectious Diseases (USAMRIID) transition team hosted a tour of the facility. The new USAMRIID facility is the largest and most complex biocontainment facility ever designed for NMRC. (Photo courtesy of USAMRIID)

SILVER SPRING, Md. – The transition team for the construction project of the new U.S. Army Research Institute of Infectious Diseases (USAMRIID) hosted representatives from the Naval Medical Research Center (NMRC) for a tour of the new spaces at Ft. Detrick, in Frederick, Maryland, in January.

The tour, led by Lt. Col. Twenhafel and Mr. Poltorak, highlighted the future laboratory spaces of USAMRIID to the NMRC Commanding Officer, Capt. Jacqueline Rychnovsky and representatives of the Naval Medical Research Center and the NMRC Biological Defense Research Directorate located at Ft. Detrick.

According to the USAMRIID public affairs officer, the new USAMRIID facility is the largest and most complex biocontainment facility ever designed. It took years of planning and was designed with two major themes—flexibility and redundancy—in mind.

The facility has almost 1 million total gross square feet. Approximately one-third of the total square footage is occupied space; one-third is the mechanical space necessary to maintain the large biocontainment suites; and one-third is support space, which includes corridors, stairwells

and other areas. The building is currently under construction with an estimated completion date sometime in 2017.

The design includes East and West buildings connected by a large atrium. The facility contains Biosafety Level 2, 3, and 4 laboratories; a vivarium; administrative space and conference rooms; and a variety of specialized research capabilities. When completed the facility will house the largest collection of BSL-3 and BSL-4 containment laboratory space in the world.

Due to the Base Realignment and Closure Act (BRAC) of 2005, USAMRIID and NMRC have become closer collaborative partners in biodefense when NMRC's Biological Defense Research Directorate (BDRD) was moved Ft. Detrick Maryland, home of USAMRIID.

(From left) Lt. Col. Twenhafel, Lt. Cmdr. Harrison, Lt. Cmdr. McCoy, Capt. Rychnovsky, Capt. Hall, Cmdr. Doan, Mr. Bassett, Dr. Phan and Mr. Poltorak, during a visit to the new USAMRIID building at Ft. Detrick, Maryland. (Photo courtesy of USAMRIID)

